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ARCHIVES OF PEDIATRICS

A MONTHLY DEVOTED TO THE

DISEASES OF INFANTS AND CHILDREN

JOHN FITCH LANDON, M.D., Editor

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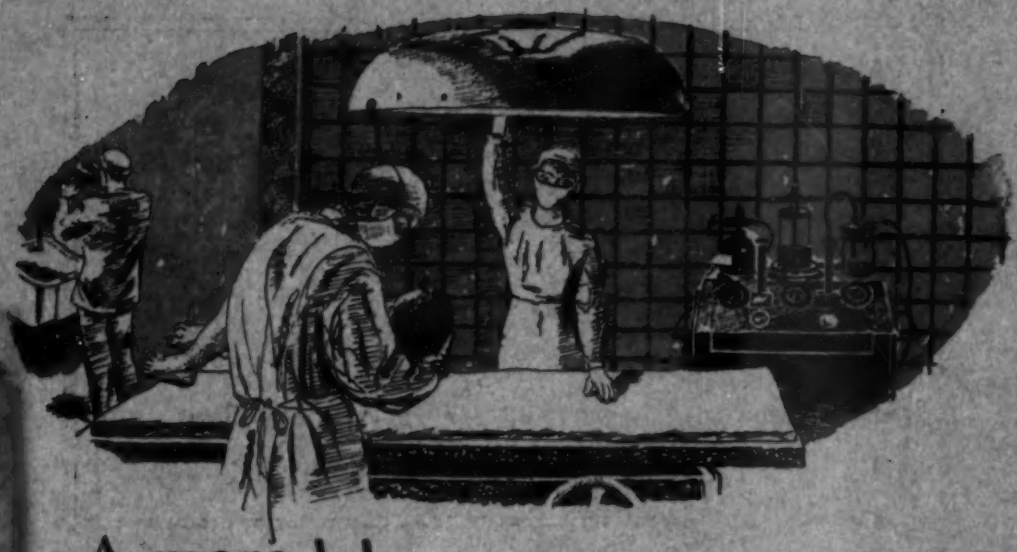

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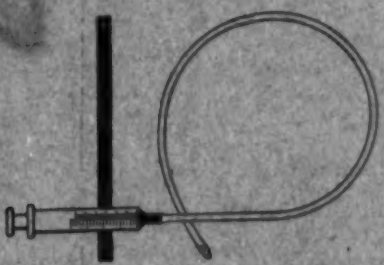

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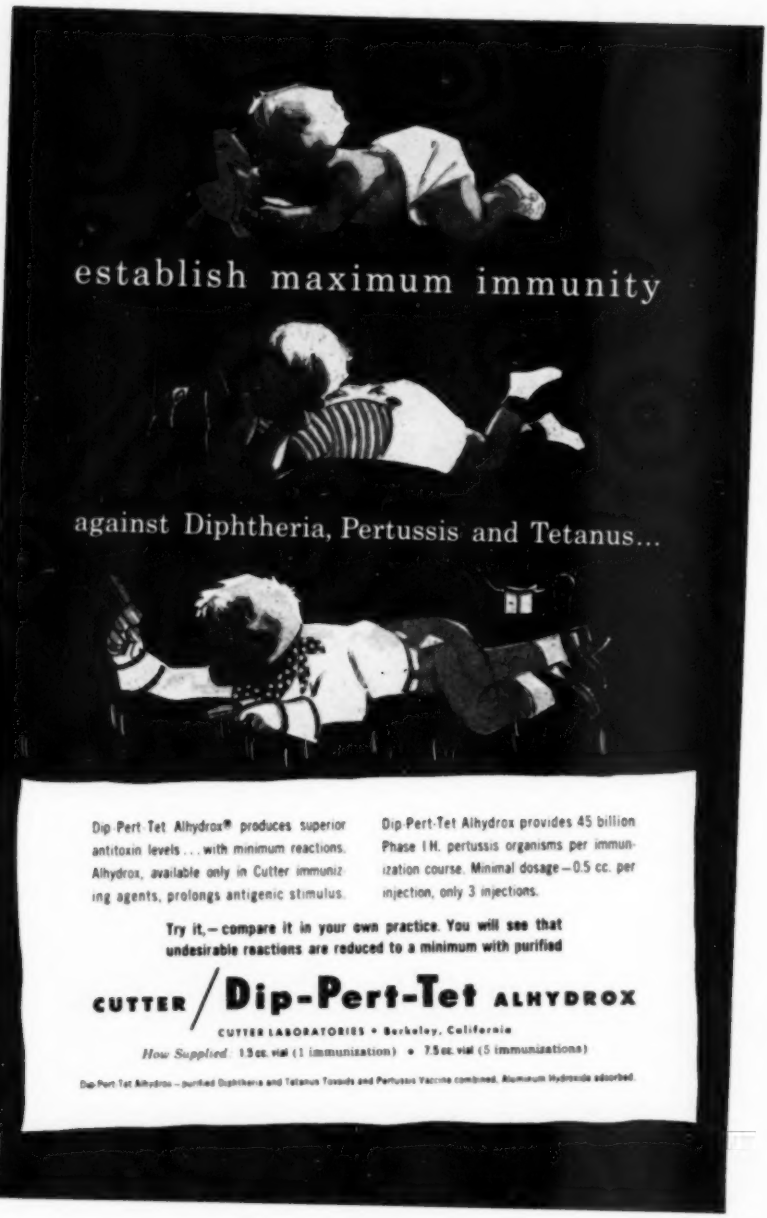

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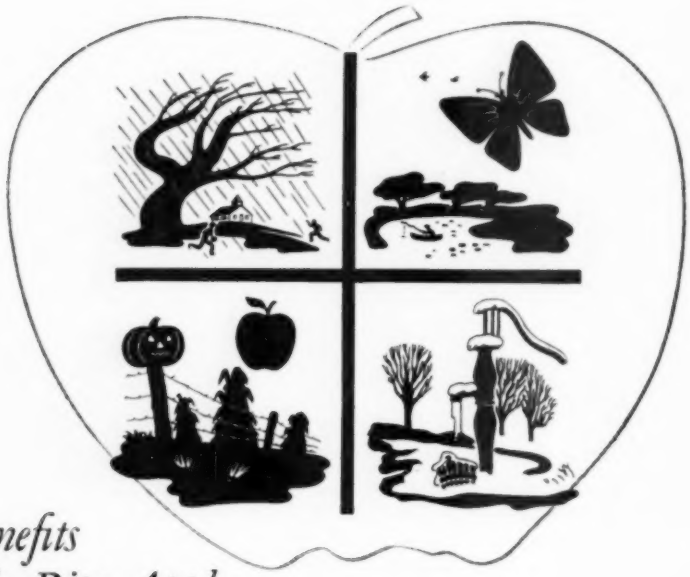

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2. Council on Foods, American Medical Associations Accepted Foods and Their Nutritional Significance, Chicago, American Medical Association, 1939, p. 208.

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1. Heimer, C. B., Grayzel, H. G., and Kramer, B.: Archives of Pediat. 68:382, 1951.
2. Behrman, H. T., Combes, F. C., Bobroff, A. and Leviticus, R.: Ind. Med. & Surg. 18:512, 1949.

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*Cayer, D.: General Considerations of Vitamin Deficiencies, in Kyser, F. A., Therapeutics in Internal Medicine. New York, Thomas Nelson & Sons, 1930, p. 288.

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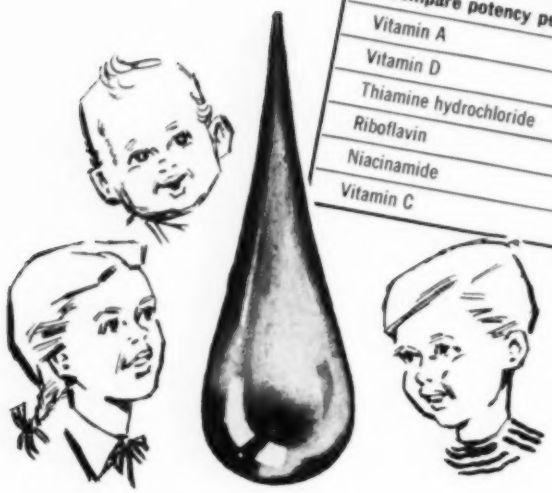

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INHIBITION OF COL.-SK VIRUS HEMAGGLUTINATION BY HUMAN SALIVA*

C. W. JUNGEBLUT, M.D.
B. HORVATH, M.D.
AND
A. W. KNOX, Ph.D.
New York.

As was first shown by Francis and Minuse in 1948, normal human saliva has an inhibitory effect upon hemagglutination by influenza virus.[1] We have undertaken experiments to determine whether saliva would also inhibit Columbia SK virus hemagglutination. A standard technique for this hemagglutination reaction has been described elsewhere.[2] The present paper reports that such inhibition occurs. However, the agents inhibiting the two hemagglutinating systems apparently are not identical, because a given sample of saliva may be positive with respect to Col. SK virus, but negative with respect to influenza virus.

The Columbia SK hemagglutination inhibition test was carried out in the following manner: A ½ per cent suspension of red blood cells (sheep, or human 0) was mixed with an equal volume of two-fold dilutions of the centrifuged saliva specimen. After one hour contact at room temperature, the cells were centrifuged, washed, and resuspended to yield a ¼ per cent concentration. Aliquots of this suspension were then combined with serial dilutions of Col. SK virus (brains harvested from infected mice) and the tubes were placed in the icebox for 4-6 hours. The diluent for all

*From the Department of Bacteriology, College of Physicians and Surgeons, Columbia University, New York City.
Aided by a grant from the Sister Elizabeth Kenny Foundation.

reagents in the test was potassium-veronal buffer.[2] Results were recorded as number of hemagglutinating units (H.U.) inhibited, in comparison with a control virus titration.

With inhibitory samples it was invariably found that higher saliva dilutions inhibited progressively less virus, but it was not always possible to demonstrate a fixed proportionality between amount of inhibitor and number of H.U. inhibited. The mechanism of the inhibition is not clearly understood. With better knowledge of the factors involved it might become possible to improve the present semiquantitative test. Table 1 gives a sample protocol in which specimen 1 shows strong inhibition, specimen 2, moderate inhibition, while specimen 3 has no inhibitory effect.

Considering the conditions under which the tests were carried out, it appears that the inhibitor acts on cells rather than on virus. The inhibitory principle is heat labile, being destroyed at 56° C. in 30 minutes, but survives short ultraviolet irradiation and resists storage at icebox temperature for several weeks. The inhibitor does not pass ordinary dialysis membranes. It is distinct from either lysozyme or salivary amylase, both of which fail to inhibit viral hemagglutination. It may possibly be related to Schiff's blood group substance-destroying enzyme, which occurs erratically in the saliva of certain individuals, or it may represent an entirely new factor, conceivably even a non-pathogenic form of virus. In some tests, adsorption of the inhibition could be demonstrated on human 0 cells, and, following treatment with a positive saliva sample, such cells became panagglutinable. Thus, the effect is comparable, in some ways, to that produced by contact of red cells with Burnet's receptor-destroying enzyme (RDE), extracted from cholera vibrios.

A coctostable factor, which neutralizes Col. SK virus in mouse infectivity tests, was also found in some saliva specimens, but its presence could not be correlated with the thermolabile hemagglutination inhibitory property. This antiviral factor may be similar to a poliocidal principle which has previously been described.[3]

Saliva samples of approximately 40 healthy individuals were examined for inhibition of viral hemagglutination. The saliva of a majority of the donors never exerted the slightest inhibitory effect. Moderate inhibition was obtained with samples from a few individuals, and one donor possessed marked inhibitory power in his saliva. The persons whose saliva inhibited to various degrees

Table I

Inhibition of Col. SK Virus Hemagglutination
by Human Saliva

Sheep erythrocytes treated with saliva from:-		Dilution of saliva	Reciprocal of virus dilution								Control: normal mouse brain	Number of H.U. inhibited
Donor	Date of specimen		10	20	40	80	160	320	640	1280		
1. C.W.J.	5/29/51	1:2	0	0	0	0	0	0	0	0	0	>32
		1:4	0	0	0	0	0	0	0	0	0	>32
		1:8	0	0	0	0	0	0	0	0	0	>32
2. E.M.	5/29/51	1:2	2	1	0	0	0	0	0	0	0	8
		1:4	2	2	1	1	0	0	0	0	0	2
		1:8	2	2	2	1	1	0	0	0	0	1
3. C.W.J.	5/30/51	1:2	3	2	2	2	1	0	0	0	0	1
		1:4	3	3	2	2	1	1	0	0	0	0
		1:8	3	2	2	2	2	1	0	0	0	0
Control: untreated erythrocytes		-	3	2	2	2	1	1	0	0	0	-
Hemagglutinating units		(H.U.):	32	16	8	4	2	1	-	-	0	-

Note: The intensity of hemagglutination is recorded as:- 0, no hemagglutination; 1, minimal visible hemagglutination; 2, moderate hemagglutination; 3, heavy clumping of cells.

showed sharp fluctuations in the amount of inhibitor present on consecutive days, and changes from a positive to a negative sample occurred at irregular intervals, often over short periods of time. Negativity was apparently not due to appearance of an antagonistic factor, since mixing a negative with a positive sample from the same individual had no influence on the inhibitory power. However, a positive sample from one person lost its potency occasionally when mixed with a negative sample from another person. No correlation was found to exist between the presence of the inhibitor and the following variables: (1) sex, (2) time of day of collection of specimen, (3) dietary or smoking habits, (4) menstrual cycle, and (5) pregnancy. Correlation with age is questionable, though children seem to possess the factor more frequently than adults. Samples of moderate potency were obtained from donors with blood groups O, A and B, and from secretors as well as from non-secretors. However, the person whose saliva contained maximal amounts of inhibitory principle belonged to blood group A_2 and was a non-secretor. There is, therefore, no clear connection with any of the blood groups of the O-A-B system and the presence of the inhibitor in saliva. It remains to investigate whether production of the factor is related to any other system of blood group antigens, especially the Lewis system.

Saliva specimens were collected over a period of ten consecutive days from a group of 17 individuals diagnosed as abortive or paralytic poliomyelitis during the acute stage of the disease.* The following results were obtained: Saliva from 12 patients consistently inhibited Columbia SK virus hemagglutination over the entire test period, while the remaining 5 individuals yielded only occasional inhibitory samples. The group of 12 "consistent inhibitors" included the only 5 cases which could be considered as having had the full clinical picture of paralytic poliomyelitis. The saliva of normal individuals, irrespective of age, has not been found to inhibit so frequently, nor to maintain inhibition over so long a period of time. The significance of this phenomenon is being further investigated.

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*We are indebted to Dr. M. Zehnder of the Kenny Institute, Jersey City Medical Center, Jersey City, N. J., for supplying these specimens.

VOLVULUS IN THE NEWBORN WITH SILENT HEMORRHAGE

Report of an Unusual Case

Bedford H. Berrey, Captain, MC. AUS*

AND

Milton H. Hollander, Lt. Colonel, MC. USA**

Denver, Colo.

The clinical picture of volvulus in the newborn is striking, with vomiting the most prominent symptom. Such is usually present at the onset and recurs with increasing frequency as the obstruction becomes complete. Abdominal distention, dehydration and fever follow, with death resulting if surgery is not performed or if too late. Operative reduction is usually successful only in early cases, therefore prompt diagnosis is essential.

The following case is reported because of its unusual nature, without the presence of the expected physical findings. Rapidly progressive pallor and anemia were the only remarkable findings in this infant, suggestive of a hemorrhagic disorder, the cause of which was not readily apparent. The various causes of pallor and/or anemia considered included asphyxia pallida, severe erythroblastosis, hemorrhagic disease of the newborn, sepsis, congenital thrombocytopenic purpura and other blood dyscrasias. These were satisfactorily eliminated by the history, physical examination or suitable laboratory procedures prior to surgery. Rupture of the spleen or liver incident to birth trauma was also strongly considered.

CASE REPORT

A full term female infant, weighing eight pounds four and one-half ounces, was born of a normal pregnancy and delivery. The immediate neonatal course was uneventful, and she eagerly took five per cent glucose water at twelve hours of age. Satisfactory breast feeding was begun at eighteen hours and continued until forty hours of age. When seen at forty hours of age she was markedly pale, with petechiae over the face and upper chest and a distinctly palpable upper abdominal mass. During the intervening ten hours before surgery, the pallor increased, as did the petechial

*Chief Pediatric Section, Fitzsimons Army Hospital.
**Resident Pediatrics, Fitzsimons Army Hospital.

distribution, the abdomen showed continuing enlargement, with distention. A bluish discoloration was observed around the umbilicus (Cullen's sign) which extended to the hypogastrium. These were noted soon after the pallor became apparent, and progressed rapidly until surgery.

Hematological (Table 1) and roentgenographic studies were performed to rule out various blood dyscrasias and/or abdominal masses. Serial hemograms prior to surgery disclosed the rapidly progressive anemia. Roentgenograms of the abdomen revealed gas shadows in the stomach and scattered throughout the intestinal tract (Fig. 1).

Rectal examinations were negative. The abdomen continued to distend, with no audible peristaltic sounds. There was no vomiting, and several normal appearing meconium stools were passed.

Laparotomy was performed at fifty hours of age under drop ether anesthesia. Whole blood and appropriate fluids in conventional amounts were given intravenously before, during and after surgery. Upon opening the abdomen, the peritoneum was blue-black and markedly tense. Distended loops of gangrenous bowel protruded when the peritoneum was incised. The entire small bowel, with the exception of the proximal two inches of jejunum and the distal one and one-half inches of ileum, was involved in a severe volvulus. The mesentery was ecchymotic, with thrombosis and gangrene secondary to a clockwise volvulus of two complete turns. The remaining abdominal organs appeared normal in all respects.

Resection of the involved bowel was accomplished, with an end-to-end anastomosis between the upper jejunum and the lower ileum. Streptomycin 0.25 gram and penicillin 50,000 units were instilled in the peritoneal space and the wound was closed. The patient returned to the ward in fair condition.

Postoperatively, she gradually improved and the petechiae faded. Thirty-six hours later she was offered five per cent glucose water, five cubic centimeters every two hours, which was well tolerated; oral fluids were gradually increased to tolerance. Bowel sounds were frequent, and there was only an occasional minor regurgitation until the fourth postoperative day.

Abdominal distention with respiratory distress became apparent at this time. Roentgenograms (Fig. 2) again were not significantly

FIG. 1. *Laboratory Results Pre- and Post-Operatively*

	RBC Million/ CMM	Hgb. grams	WBC/CMM	P	L	M	Nuc. RBC	Coomb's Test	Capillary Tube Bleeding Time	Clotting Time	Platelets	Quick Prothrombin Time	Serology Cardio Lipon Floc.	Blood Culture
												51% Norm		
24 Sept. '51	2.2	7.8	26,850	66	34		7/100	Neg.	1 min 15 sec	3 min 30 sec	76,480	21 sec Control	Neg	No growth
10 A. M.														
4 P. M.	1.6	5.6												
10 P. M. (After Surgery)	4.4	14.2	12,000	81	14	5								
25 Sept. '51	4.3	14.2												
26 Sept. '51	5.4	17.6	7,150	92	8						63,000			
Second Laparotomy on														
28 Sept. '51	6.1	18.6	20,850	86	8	6								
2 Oct. '51	6.3	21	21,600	66	30	2	/2E							
3 Oct. '51		14.2	10,700	84	14		/2E							
5 Oct. '51		15.6	8,950	43	54	3								
11 Oct. '51		15.4	17,450	51	40	7	/2E							
13 Oct. '51	7.3	20.8	34,600	90	10									

Throat culture revealed hemolytic streptococcus viridans. Wound culture revealed E. Coli in moderate growth.

abnormal. It was felt that peritonitis might be present due to rupture at the site of anastomosis, and a second exploratory laparotomy was performed on the fourth postoperative day. Antibiotics (penicillin, streptomycin and chloramphenicol) were instituted in conventional doses and continued until ten days after the second operation.

This second procedure was carried out as before. Bile was observed in the peritoneal space, leaking from a breakdown in the anastomosis as well as from a perforated ulceration in the ileum, one centimeter from the ileocecal valve. These were repaired, a drain was left in place, and the abdomen was closed.

Intravenous alimentation was necessary during the next three weeks. Oral feedings resulted in rapid passage through the abbreviated gastro-intestinal tract, with apparently little or no absorption. Fig. 3 shows the roentgenogram of the abdomen approximately one week prior to death. Postoperative course was steadily downhill despite adequate intravenous blood, protein and electrolyte solutions. A physiologically impossible situation was evident, with progressive "metabolic bankruptcy."

Twenty-six days after the initial laparotomy she died, weighing five pounds eight ounces. An autopsy was performed.

PATHOLOGICAL FINDINGS

Surgical Specimen. Massive infarction of the small intestine due to torsion of the mesentery and obliteration of the arciform mesenteric vessels. Intra-intestinal hemorrhage and necrosis of the entire surgically removed small bowel was evident.

Gross. The fresh specimen consists of approximately 70 cm. of small intestine which measures 1.5 x 1.5 cm. in diameter. The intestine is dark red in color, the intestinal wall is thin and dilated, the lumen is filled with dark reddish-black blood. The intestinal loops are tightly kinked about a segment of the mesentery which is twisted upon itself twice and from which numerous adhesions extend binding the loops of bowel tightly together. There are three areas of volvulus noted and, although no individual vessels can be made out, there is obviously strangulation of the mesenteric arciform vessels.

Microscopic. The section is through small intestine and mesentery. The lumen is filled with red blood cells which are tightly

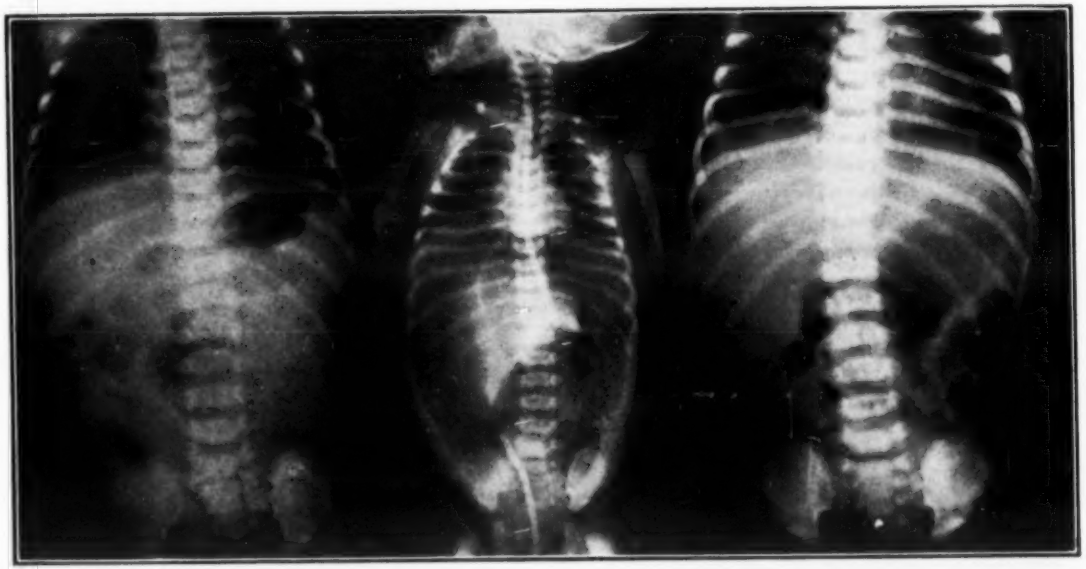

Fig. 1. Scout film of abdomen obtained prior to surgery showing gas in stomach and scattered throughout the intestinal tract.

Fig. 2. Roentgenogram on fourth post-operative day prior to second laparotomy.

Fig. 3. Roentgenogram obtained one week after second laparotomy. Patient three weeks old.

packed. There is total destruction of the architecture of the intestinal wall. A few isolated glands are seen between the red blood cells, and these glands are partially autolyzed and the cells have lost their outline. The submucosa and muscularis are hemorrhagic. The remainder of the muscularis and serosa appeared normal surrounding an area of massive hemorrhage. Mesentery contains a few obliterated vessels. There is marked hemorrhage into fat. No malignancy or specific infection is present.

Autopsy findings of significance were limited to the abdominal cavity and the gastro-intestinal tract in particular.

Gross. The liver is relatively large and weighs 285 grams. Its surface is quite smooth, except for the lateral portion of the left lobe where it was dissected away from adhesions to the left lateral wall and spleen. Cut surface reveals solid, firm dark brown tissue with the usual hepatic architecture.

The gallbladder is of average size, thin-walled, and contains approximately 3 cubic centimeters of a thick, green mucoid bile. The biliary passages are unobstructed.

The gastro-intestinal tract appears to be composed of stomach, duodenum, an extremely small portion of jejunum, terminal ileum and colon. There is a 3 centimeter length of bowel, 6 centimeters from the pylorus, which presents a thick, greenish wall and is somewhat friable and necrotic. It was about this portion of the bowel that the grayish liquid material was found, almost completely enclosed in a pocket of fibrous adhesions. The colon is knotted into an irregular mass by numerous fibrous adhesions which have produced multiple partial obstructions. No areas of perforation are found.

Microscopic. Sections of the liver show dilatation and congestion of the sinusoids. Also noted are scattered clear vacuoles of various sizes within some of the liver parenchymal cells.

A section taken from the esophagus reveals no abnormalities whatsoever. A section taken from the stomach reveals some hemorrhage, degeneration and necrosis in the serosal layer and outer portion of the muscularis layer. Sections of the intestines show hemorrhage, massive areas of degeneration and necrosis and the presence of scattered chronic inflammatory cells with a few acute inflammatory cells in the serosal layer and outer muscularis portion. A necrotic mass from the intestinal wall contains a large

blood vessel which is occluded by an organized thrombus. Another section taken from the colon appears relatively normal except for the presence of a small focus of large fibrocytes and chronic inflammatory cells in the serosa.

DISCUSSION

A volvulus may be defined as an axial twist of the bowel, capable of producing partial or complete obstruction of the bowel, with interruption of the normal blood channels. This infant was unusual in that there was no vomiting or constipation to suggest the diagnosis; likewise, roentgen studies were of no positive value.

Presence of pallor, rapidly increasing anemia and petechiae, suggested a blood dyscrasia. All hematologic studies were considered normal except to indicate the progressive anemia.

The pre-operative diagnosis considered most tenable was a probable traumatic rupture of the spleen or other abdominal organ. The volvulus apparently was produced by a malrotation of the small intestine and cecum, with two clockwise spirals beginning at the base of the mesentery.

Torsion in a volvulus may vary from a one-half turn to three or four turns, and varies in degree of tightness. Pathological changes in the affected portion are directly related to the degree of twisting and tightness; the looser the torsion, the less the bowel is damaged, and incomplete obstruction occurs with moderate distention. With increasing torsion and tightness, obstruction becomes complete, with accumulation of gas in the affected loop or loops. Venous distention follows blockage of mesenteric vessels, resulting in engorgement, edema and discoloration of the bowel wall. A serosanguinous exudate fills the bowel lumen as well as the peritoneal space. Continuation, without surgical relief, results in gangrene and secondary peritonitis due to passage of bacteria through the damaged loops of the intestine.

The reported mortality is lowered with early surgical correction.[1] The only satisfactory treatment is surgical. If reduction is feasible, measures may be taken to prevent recurrences by properly anchoring the ascending colon to the lateral abdominal wall. Priolean[2] reported two cases of massive resection of the small bowel; one patient had forty per cent of the bowel removed, and did well except for poorly formed stools; the other lost approximately fifty-three

per cent of the small intestine, with resultant progressive nutritional death. Bowen[3] has stated that resection and anastomosis remain the only solutions where reduction is impossible, or when the bowel is beyond salvage. Obviously, the less bowel resected, the lower the probable mortality rate.

In the case presented it was necessary to resect the entire small bowel with the exception of the proximal three centimeters of jejunum and distal one and one-half centimeters of ileum, approximately ninety per cent of the small intestine. Such resection resulted in a total loss of the absorptive surface of the gastro-intestinal tract, as well as loss of the succus entericus and other digestive enzymes. The extreme shortness of the remaining intestine caused a direct loss of bile and pancreatic secretions in the stools. Massive resection of this type performed on dogs by Jensenius[4] invariably gave similar results with increasing general debility terminating fatally.

Meyer and Criep[5] reported a case of tetany in a seventeen-year-old male following extensive small bowel resection. Control of the tetany was accomplished by a low fat, high protein and high carbohydrate diet with acidifying salts, soluble vitamin D, tincture of opium and bismuth subcarbonate.

Little has appeared in the pediatric literature dealing with this problem in the newborn, its correction and postoperative management. Gerty[6] has reported four cases of intestinal obstruction in the newborn; one of these was a complete volvulus of the entire small intestine and cecum. Detorsion of the volvulus was accomplished with resection, and recovery was uneventful.

SUMMARY

This case is cited to stress the necessity for consideration of such a pathological process when one is confronted with severe progressive pallor and/or anemia in a newborn infant with abdominal distention and few or no definite signs of intestinal obstruction. Lack of familiarity with this condition prohibited earlier surgical intervention in this infant. Meconium stools without vomiting, as well as scattered gas in the intestinal tract demonstrated radiographically, added confusion and delay in initiation of corrective measures.

Rapidity of diagnosis is fundamental for the proper correction of

the etiological basis for progressive anemia in the newborn. Massive silent intestinal hemorrhage must be considered even though clinical evidence of obstruction, volvulus or mesenteric thrombosis is absent.

Earlier diagnosis and corrective surgery in similar problems, after other causes of anemia are ruled out, should increase the survival rate.

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ORIGIN OF LUNG CYSTS IN CHILDHOOD. (Archives of Disease in Childhood, London, *26*:504, Dec. 1951). Occasionally, indisputable evidence that lung cysts are congenital is provided at necropsy on a stillborn fetus, but oftener the conclusion as to whether the disease is congenital or acquired is based on embryologic and histological data supported by conjecture. In this paper a group of cases are reported in which the development of lung cysts was studied by prolonged clinical observation and serial radiography. The author does not doubt that some cysts are congenital, but the evidence he presents supports the hypothesis that most pulmonary cysts are acquired, and that they are generally the product of mechanical and inflammatory forces. Evidence of inflammation is often seen at necropsy. There are bound to be gradations from cysts due to purely mechanical factors to necrotic cavities that are entirely the result of infection. The following classification of lung cysts has been used: (1) emphysematous and interstitial bullae, blebs, and pneumatoceles; (2) lung abscess, pulmonary infarction with necrosis, and bronchial distension; (3) tuberculous cavitation; (4) multiple honeycomb lung; and (5) traumatic cysts. Cases illustrating these different types are discussed.—*Journal A.M.A.*

CLINICAL REVIEW

In order to encourage the writing of clinical articles by recent graduates or senior medical students, the* ARCHIVES *will publish monthly at least one such paper from the classes of Doctor Reuel A. Benson, New York Medical College, New York, and Doctor Philip Moen Stimson, Cornell Medical School, New York. Other interested medical schools are cordially invited to submit student papers for consideration.

POLIOMYELITIS*

A DISEASE PROCESS AND A COMMUNITY PROBLEM

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(Continued from July issue)

A COMMUNITY PROBLEM

Prevention and Control of Polio. The prevention of poliomyelitis is the responsibility of the community: the setting up of educational facilities, adequate medical personnel and equipment, financial aid for equipment and research and an efficient staff in the Public Health Department to keep a strict check of cases, and isolation of patients.

It is extremely important that both the public and the physician are aware of the severity and frequency of this disease. The public should be educated as to what preventive measures have been developed by medical research in the prevention of polio. The physician should be cognizant of the necessity of early recognition and reporting of cases of polio, and the proper isolation treatment and rehabilitation of the individual, as well as the epidemiology of the disease process.

In order for an efficient program of polio, prevention and control to be instituted, it is mandatory that there are adequately trained doctors and nurses who, in general, may help supervise the community health as a whole. There must be the necessary hospitals with adequate laboratory facilities and the means of procuring additional personnel and equipment in case of an epidemic.

*Submitted as a fourth year research paper in Public Health at Cornell University Medical College, New York City.

Dr. H. J. Sedden,[79] at the first International Poliomyelitis Conference, proposed a workable solution for the formulation of an organization for the control of polio, with trained doctors, nurses and physiotherapists and adequate facilities for the handling of patients. At the periphery, the local doctor reports all cases to the center. Next is the investigation of the patient and the people in his immediate environment for the control of spread, followed by admittance of the patient to the center; also adequate educational facilities for the public through dissemination of pamphlets, school and public lectures. Post-hospital rehabilitation progress should be followed in out-patient clinics, finding suitable work for disabled patients and rehabilitation so that they may carry on a useful and fruitful existence. In the beginning, the intelligent planning in prevention and control of such diseases as polio., as well as many other disease processes, may save the community a lot of money and the loss of the services of many individuals.

The following are some guiding principles in the prevention and control of polio, according to Sabin[80]:

1. More virus is being disseminated during an epidemic of polio. than at any other time.

2. Polio. virus is present for a short time in the throat and more frequently and for a longer time in the gastro-intestinal tract and stools of certain apparently healthy individuals as well as those affected.

3. The virus may be transmitted by intimate contact, contamination and fomites. There is no evidence that the virus is ordinarily present in the nose or that droplets from the respiratory tract play a significant rôle, if any at all, in the dissemination of the polio. virus.

4. It is believed that, during an epidemic, flies may be contaminated and can deposit infective amounts of the virus on food and that consumption of such food can produce the disease.

Due to the conflicting and confusing views on the prevention and control of polio., a national conference on recommended practices for the control of polio, was held in June 1949.[81] The object of this conference was to present the existing knowledge of the prevention, control and public health measures best suited for polio. and also to correct many misleading procedures that have been and are being carried out throughout the country. An example of this is the isolation and quarantine measures which have been

enforced which were unnecessary as a control measure. Unnecessary quarantine regulations, over long periods of time, have created fear and socio-economic problems for the patient and his family and wasted precious time and money for the medical personnel and facilities. Thus, the committee undertook to re-evaluate the status of the prevention and control of polio. They first delved into the matter of preventive measures; after considering various immunization and predisposing factors, they came to the conclusion that specific prevention is not available but general measures could be undertaken such as avoidance of fatigue and elective operations. They next considered the methods of control for polio. and recommended the following procedures: In the case of the patient diagnosed as polio.—recognition of the disease and reporting it, both paralytic and nonparalytic forms, is essential as soon as possible. Reporting of differentiation between paralytic and nonparalytic cases is necessary for adequate statistical analysis in comparison with past experience. Certain criteria are necessary for the presumptive diagnosis of polio.: A history of fever, stiff neck, association with other cases in the community or suspected outside contacts, a spinal fluid count of 10 to 500 cells per cc. taken during the acute stage or during early convalescence of the disease, a spinal fluid protein elevation, and some demonstrable muscle weakness (or paralysis). A person having a majority of the above signs may be diagnosed as having paralytic polio. Paralytic cases are those in which there has been definite muscular weakness (or paralysis) at the time of at least two examinations by a physician, with an interval of at least several hours between examinations. Patients who show exposure to polio. through individual contact or in a community in which polio. is prevalent and having an elevated temperature, should be watched for clinical manifestations of the disease.

Isolation of a patient should be carried out from the date of the onset for the duration of the fever, or if the fever lasts more than one week, the isolation should last for the duration of the fever. This is recommended because it is believed that the greatest period of communicability occurs during the last few days of the incubation period (7 to 14 days) and the first week of the clinical manifestation. It is believed that after one week of the acute illness, the contagion drops significantly.

There are certain foci of contamination which should be guarded against and certain measures taken for their control. Contaminants, such as nose and throat discharges and feces, which are infectious, should be supervised carefully and disposed of by disinfectant methods and proper sanitation.

Quarantine as an effective measure of control has been of no proven value. It puts restrictions on the individual and interferes with the effective workings in the community. Investigation of the source of infection is invaluable as it will often lead to the early detection of undetected and unrecognized cases of the disease.

It is up to the public health authorities in the community, along with federal and state financial and equipment aid, to carry on certain epidemic procedures. The health service should keep in contact with the physicians of the community, informing them of the incidence of the disease, the description of the usual characteristics of its onset, impressing upon them the need for early diagnosis and medical care, especially as regards the acute cases. Also, the community as a whole should be supplied with information concerning the gravity of the situation and the precautions to be taken. Also, the service should see to it that there are adequate facilities for the care and treatment of the patients and the proper prophylactic care is carried out, i.e., the avoidance of excessive physical strain and unnecessary congregation of children when polio. reaches epidemic proportions; also in regard to epidemics, it is important to have sufficient facilities for the isolation and bed rest of all children with fever until diagnosis is confirmed or denied; education in beside nursing, such as will prevent the spread of the infectious material from the patient to others with whom he may come in contact. Postponement of elective teeth extractions, tonsillectomies, adenoidectomies or other nose and throat operations is also important.

If it is possible, all patients with acute manifestations of the disease, showing signs of paralysis, should be admitted to a hospital, provided that there are adequate isolation practices carried out. The isolation procedures carried out are the same as those that would be used in the case of any other communicable disease; no specific procedures are necessary. All polio. patients should be segregated together. The sterilization of all utensils used by the patient, hospital washing of linen and ordinary precautions for the

handling of articles from the infected persons must be carried out. Adequate disposal of excreta and proper sanitation is necessary; proper precautions for medical personnel should also be instituted, i.e., washing of gowns worn when in contact with patients, hand washing after examination of patient or excreta, etc.

As for home care, all necessary precautions as stated in the above paragraph, should be carried out as far as possible, with the facilities of proper nursing care.

There has been a great controversy, during polio. epidemics, over the closure of schools, swimming pools, theatres, etc., as a method of controlling the spread of the disease.[82, 83] In the past, it has been noted that such procedures have not had a significant effect on the prevention and spread, and in carrying out the above procedures, the socio-economic pattern of the communities have been upset and altered and the normal routine of everyday life for the individual and for the family has been disturbed. It is therefore felt today that many such procedures are unnecessary and should not be carried out except under certain circumstances. However, it is sometimes wise to delay the opening of schools in places where children come from over a wide area and there is a likelihood of spreading the epidemic from one area to another; likewise boarding schools should delay opening if an outbreak occurs in the area in which the school is located, thus preventing children from localities where the disease is not prevalent from entering one in which the disease is prevalent. This prohibition also includes camps and other organizations for children when the epidemic is widespread.

It is recommended that the health service does not take action to close or prevent the operation of fairs, circuses, theatres and swimming pools, etc., when these places are properly operated, but that they should discourage children from attending. It is imperative that the public health organization should have the full cooperation of the public as a whole and therefore unnecessary actions which would tend to disrupt the community life and thereby bring antagonism against the service should be avoided.

Resistance and Immunization. Up to this time, there has been no good method of immunization of the public against polio. In 1910, Landsteiner and Levaditi[84, 85] proved the existence of specific antibodies, recoverable in the blood of monkeys who had been in

contact with polio, and shown specific signs of the disease. The evidence was amassed through neutralization tests and, at the time, there was hope that specific passive immunity could be obtained by way of serum therapy containing antibodies. However, over the next few years, many experiments were carried out in order to find an appropriate technic whereby antibodies produced in the serum of experimental animals could be used in the therapy of polio.; however, none proved satisfactory in forms of therapy but did help in the epidemiological study of polio, to some degree. Events proved that the neutralization tests were very expensive and not too accurate. Through these experiments it has been determined that a high per cent of normal individuals show the specific antibody, thus showing that a certain degree of active immunization occurs following exposture to polio, whether it is manifested in a clinical form or not, as some of these individuals showed no history of polio. Active immunization has been proven experimentally by Flexner and Lewis and Levaditi and Landsteiner in experiments on monkeys in 1910. These two groups of investigators showed that monkeys, having recovered from a proven case of polio, resisted a second inoculation of the same virus. Subsequent experiments by later investigators with the use of different stains, have shown that this resistance is a relative and not an absolute one.

Active virus and viruses modified by heat, drying, formaldehyde, phenol, immune serum, aluminum hydroxide gels and sodium ricinoleate have all been prepared and inoculated into monkeys, using many different roots for their administration. None have been truly satisfactory and many fatalities have resulted. In most cases, sufficient titres of antibodies have been demonstrated in the animals. However, resistance to subsequent inoculations has been for the most part unsuccessful. In 1936 and 1938, Kramer and associates[86, 87] carried on a careful study of immunization with the use of neutralized antiserum virus and showed approximately a 70 per cent success in resistance to subsequent inoculation. However, the number of cases was small and some of the animals died from the immunizing treatments. In 1945, Milzer, Oppenheimer and Levinson experimented with Lansing virus by inactivating it with ultraviolet radiation and their results were good in inducing immunity in mice. However, when this was tried on monkeys,

there was no response of serum antibodies and no immunity to subseqent inoculations.

Up to date, the most extensive experimental work has been done with formalin-treated virus and variable results have been obtained, some favorable and some not. Within the past few years, repeated intramuscular injections of formalin inactive vaccine has been used in monkeys and a significant number of these animals proved to be immune to the same amount of homologous virus as was used in animals who were immune from active vaccine used in experimental forms of the disease.

Active artificial immunity in children has been attempted and in some cases has resulted in the death of the child. The vaccine used was a formalized virus which had been tested on monkeys and proved noninfectious and nonfatal, causing an adequate antibody response sufficient for adequate immunization against added inoculation in some cases. However, the results, in children, have not been proved beneficial. In 1936, Kolmer and associates[88] experimented with a sodium ricinoleate mixture of the virus, which, when tried on monkeys, was proved to be infectious, but which gave a strong antibody response and showed a definite tissue immunity. Ten thousand, seven hundred and twenty-five children received the Kolmer preparation and the results, in general, were equivocal, not showing any significant data for the subsequent use of this formula. Nine children developed clinical cases of polio, following the immunization procedure in localities where polio was not present at the time and under conditions which pointed to the vaccine as the probable source of the infection.

As of today, extensive research with the use of special preparations of the virus for active immunization is still being carried on with the hopes that eventually an active form of immunization may be found.

Similar unsuccessful attempts have been made for the protection of the individual against polio, by the use of passive immunization. Experiments with immune serum have been tried on monkeys and shown slight, if any, benefit to the animals when subsequently exposed to the disease. Convalescent serums have been tried on human beings in a carefully controlled series and have shown no beneficial results, in the active case and prophylactically.

With the lack of success in both active and passive immunization,

many nonspecific factors in resistance have been studied. It is known that many children escape critical evidence of the disease, even in the most extensive epidemics and that adults are commonly immune. Many have tried to explain this relative immunity in terms of humoral factors but nothing has been satisfactorily explained on this basis. There have been other studies that have been active in testing the hypothesis that the disease is a disorder of young children, chiefly through some glandular imbalance or nutritional deficiency and resistance is chiefly due to physiological maturation. However, this hypothesis is not looked upon favorably as it has been shown in the last number of years that the disease is becoming more prevalent in adults. Others have tried to pin down such nonspecific factors as general physical characteristics of the individual and this has been shown to have absolutely no basis except for the fact that numerous clinical observers have emphasized that a majority of children affected by the polio. virus appear to be the better nourished and apparently of the more robust types.

In the hormone investigations as to a possible connection between the activities of the hormones and ductless glands and the susceptibility to the virus, there has been nothing as yet that can be called significant. However, Sandler[89] has been making observations on the comparative frequency of poliomyelitis in a study of chronic hypoglycemia and is investigating the possible connection between the low sugar tolerance of monkeys, who are very susceptible to polio., and the high sugar tolerance of rabbits and their low susceptibility. These studies require more time to show if they have any significance.

Experiments along nutritional lines have likewise been confusing. Vitamin C has been implicated as playing a part in a neutralizing effect on polio.[90] Some experiments seemed to show that therapeutic administration of vitamin C caused increased resistance to the inoculation of polio. in monkeys; however, many of the investigators have obtained no favorable results with this method.[91] Chemical prophylaxis has also been tried, following the observation that a number of compounds, especially zinc sulphate, when applied to the olfactory mucosa of the monkey, conferred resistance to intranasal instilation of the virus in over 90 per cent of animals experimented on (Armstrong and Harrison[92]—Schultz and Gebhardt[93]). However, since it is believed that the main portal

of entry is through the gastro-intestinal tract, these experiments have had only a partial significance and attempts to prevent polio. in human beings by the use of this method have not met with any apparent success.

Since the infection by polio. under many circumstances does not go on into a paralytic disease, and since there are many cases of abortive polio., there has been considerable belief that an infection with the virus would be beneficial to the individual rather than dangerous if the initial exposure was of such character as not to endanger life through paralysis or death. However, as previously mentioned, under active immunity, the induction of the virus is not readily controlled and is fraught with many dangers to the individual. In considering the use of vaccines in the control of polio., there are many obstacles to overcome. The work in this field has only been begun recently and will soon reach a point where only humans may be used satisfactorily for research. The vaccines so far used have been type-specific and the need for a vaccine that would contain all the immunogenic types of the virus capable of inducing human disease is very urgent. Nothing is yet known of the duration of immunity in polio. following the administration of a vaccine, but previous experiments in other diseases suggest that the length of immunity depends upon the use of an active rather than an inactive virus. There is much to be done in the field of research before we achieve any modicum of success.

Undoubtedly in poliomyelitis there exists naturally acquired immunity. This is borne out by many facts. The highest attack rates of paralytic polio. are in the first decade of life. Howe[94] further estimates that there are one hundred unrecognized infections for every one recognized case. It has been noted that, with increasing age, a greater proportion of the population has circulating neutralizing antibodies. Turner, Young and Maxwell[95] studied the serum of 307 children and found that 86 per cent had developed neutralizing antibodies to the Lansing strain by the age of ten years. It would seem, therefore, that a neutralizing antibody rises with a *decrease* in the incidence of the paralytic disease. This does not necessarily mean that circulating antibodies themselves are responsible for the decrease since the bloodstream itself is not involved in the pathogenesis of the disease process.

Of greater import than circulating antibodies may be the pres-

ence of antibodies in the nasopharyngeal secretions. The region of the nasopharynx is considered one of the most favorable portals of entry for the polio. virus. In individuals with high circulating antibody, Bell[96] has been able to find high titres of antibodies in their nasopharyngeal secretions. It is a known fact that the polio. virus has been recovered from the nasopharynx of polio. victims, contacts and healthy children.

As in other diseases, the natural immunity in polio. is explained by the fact that exposure to the disease may not produce paralysis but may set up an effective immune response. This has been confirmed by observations that chimpanzees when given virus by mouth often develop neutralizing antibodies in the absence of any form of paralysis.[97]

Of even greater importance in the mechanism of immunity in polio. is the immunity of the central nervous system. In contrast to serum antibody, antibody remaining in the lymphocyte may be of great importance. Lymphocytes are able to migrate into the perivascular spaces of affected regions, to enter the subarachnoid space or to infiltrate the meninges and therefore release antibodies to a region where they are most needed.

Another source of central nervous system antibodies may come directly from the meningeal cells. Findings have been suggestive that meningeal cells often outnumber the lymphoblasts present near the affected neurons, and, by their action as macrophages, are generally considered a part of the reticulo-endothelial system. Thus there are two sources for the central nervous system antibody and their relative importance remains to be determined.[98]

In monkeys, neutralizing titres of 1 in 2,000 have been found in the gray matter of affected areas when the serum, cerebospinal fluid and unaffected parts of the brain have contained few or no antibodies. This antibody appeared 11-16 days following paralysis and lasted at least five months. The presence of such a localizing antibody makes plain the fact that the virus is halted at the convergence of a new afferent path with one already invaded. Morgan[99,100] has demonstrated that this type of immunity also develops in monkeys with yellow fever virus and in mice with encephalomyelitis virus.

In humans, however, there is no direct evidence for a specific central nervous system immunity. That there is the development

of some localizing antibody is borne out by the significant dilution of neutralizing antibodies and fixation antibodies in the cerebrospinal fluid of convalescents through a period of eighteen months after paralysis.[101]

Immunity, therefore, almost certainly follows infection by the polio. virus. The immunity may be due to the persistence of the antibodies in the central nervous system. Recognizable serum antibodies are also present but only act prophylactically as inducing passive immunity in the fetus and young infant.

Because of the parallelism of serum antibody with decreasing paralytic infection, the question of passive immunization as a prophylactic measure has often been raised. Howe and Bodian[102] could obtain no passive immunity to oral inoculation of the virus in three chimpanzees receiving large injections of homologous immune serum from vaccinated monkeys.

In humans, it seems logical that sera which has been shown to have a neutralizing effect against the Lansing strain should be of some efficacy in the treatment of polio.

Gamma globulin was given to alternate preparalytic patients with polio. during the 1944 epidemic. They were followed for six months by physicians who did not know who were the tested patients. The results from this experiment showed that there was no apparent benefit from the use of gamma globulin.

In order to obtain an adequate prevention against polio., many children have been given normal adult human convalescent serum in the hope that it might prove a useful prophylactic measure. However, the results have never been adequately measured in a controlled human experiment and no apparent usefulness has been proven.[103]

Even if an effective amount of antibody were given when an epidemic was present, the expected 2 or 3 weeks of passive immunization would be inadequate to protect children throughout the whole epidemic and this immunization would not have a lasting effect.

Active immunization has been accomplished quite readily in monkeys by the repeated intramuscular injection of the virus, both active and formalized. The immunization obviously was only against the virus used in the inoculation. The effect of the immunization was not transient but has been demonstrated in the serum

of three immune monkeys for as long as one year after the inoculation.

This offers some promise for the future immunization of humans against polio, but, as yet, presents a number of difficulties which must be overcome. One must find a readily available source of the virus. It must be completely inactivated and in a form which would cause no untoward effects to the individual, for in a disease of the low incidence of polio, no one is justified in undergoing immunization if there is a low incidence involved. The most important factor is an adequate trial in humans. However, because of the low incidence of the disease, Gillian et al.[101] have established that 15,000 children would be required to give it a fair trial.

Hyperimmune animal serum and gamma globulin have been tried experimentally as prophylactic measures in animals but these procedures are not advisable in humans, especially in places where polio is prevalent, since it is not known if a given antibody response is adequate enough to prevent an infection with the virus. Indiscriminate administration of the hyperimmune serum or of the gamma globulin to large masses of the population might result in prevention of infection and transient immunity only for a relatively short time and this would lead to a population devoid of active immunity and hence more susceptible to future infection by the virus.

The field of chemical prophylaxis has no practical place as yet in polio. However, the finding of effective agents against certain rickettsial and viral infections other than polio, has broadened the hope for this form of prophylaxis in polio.

Organizations Concerned with Poliomyelitis. The United States Public Health Service is concerned with poliomyelitis as one of the many diseases which is in its province to attempt to control. It helps provide for diagnostic services, for treatment, education and research. It aids the local and state health departments financially and provides equipment, statistical data and educational services concerning the latest knowledge of treatment and control.

The local, state and federal public health services all have played a large part in the prevention, management and control of polio, as they do in any communicable disease. To begin with, the local public health service is geared to the point of having the public receive the best information available concerning polio, for both

the physicians of the community and the public at large. It provides for reporting of polio. cases by the physician. It issues what orders it deems necessary to prevent polio. from reaching epidemic proportions. It combines with the local chapters of the National Foundation for Infantile Paralysis and other volunteer agencies to provide adequate medical facilities for the stricken patients and for the community as a whole. Since the extensive growth of the local chapters of the National Foundation, much of the work in this specific field of polio. has been taken over by the Foundation. The state and federal public health departments aid financially and supply the local chapters with the advanced knowledge in the prevention, control and treatment of polio. The federal government has various grants for research in combination with the National Foundation in medical centers throughout the country.

The health departments in cooperation with nonofficial agencies are responsible for the adequate medical care available in the community. In most states, the care of polio., during the acute stage, is classified as a communicable disease and funds are available for use through the state and county governments. In many states, government funds for the care of children and adults suffering from residual paralysis are available. Unfortunately, these funds are most inadequate, particularly with the use of modern therapeutic methods, and many nonofficial agencies, notably, the National Foundation, have taken over this field.

The National Foundation for Infantile Paralysis, which was incorporated under the laws of the State of New York on January 3, 1938, was the result of an idea of a center for after-care for polio. patients. This project was started as far back as 1927 by Franklin D. Roosevelt and a group of friends who formed the Georgia Warm Springs Foundation, non-profit making institution, exclusively for poliomyelitis. From this nucleus grew the interest of many people in the need for a large organization to give aid to the victims of polio. Through voluntary contributions and an advertising campaign for an organization, the idea for a national foundation materialized. Then slowly through the subsequent years, with Basil O'Connor as president, the National Foundation has grown both in size and usefulness.[105,106]

The first local chapter was formed in Conchocton, Ohio, on May 12, 1939. It was the first link in the present chain of 2,809

branches made up of local volunteers in all states and territories under the jurisdiction of the United States. Under the present set-up, the local chapters retain half of all the net receipts of the annual March of Dimes Drive plus receiving philanthropic contributions from their locale.[107,108]

The work of the local chapters is very important. Each chapter must try to keep informed by the Health Department of conditions in their county or local area. As it is impossible to predict an outbreak of polio., determine its probable strength, nor prevent or check the disease, it is necessary for a community to be ready to meet the demands upon it if there is an outbreak. This is imperative and actually the only course that it is possible to take at this time.

When there is an epidemic, the Health Department is the agency responsible for control measures. There are many official and voluntary agencies who take upon themselves the responsibility for treatment and care. The chapter of the National Foundation has an important chance to participate in this and coordinate the various groups and to help supply whatever is necessary to ensure good medical care for the patients. The various agencies, such as special committees, local health officers, the state representative of the National Foundation, representatives from the county medical society, the chiefs of staff and superintendents of hospitals, the superintendent of schools, editors of newspapers, directors of the Crippled Children's Service, Public Health Nursing supervisors and representatives of the Visiting Nurse Associations should be contacted by the chapter in order to meet and discuss available supplies and what measures may be taken by the community to combat or ameliorate the epidemic. The National Foundation and its chapters constitute one organization. Their purpose is to provide care for all victims of polio. regardless of race, creed or color through the coordination and mobilization on both local and national levels.

There are many essentials of chapter service which should be noted: 1. The number of hospitals in the area which are approved by the American College of Surgeons which admit acute or early infantile paralysis cases; a complete survey of how many beds each one has, whether there are sufficient beds for convalescent and orthopedic cases in the later stages of the disease in hospitals ap-

proved by the Crippled Children's Service; whether the hospitals admit cases regardless of age, race, creed or color. 2. The chapter should know what are the medical facilities in its locale; whether or not there are adequate diagnostic services; it must ascertain the number of certified pediatricians, orthopedic surgeons and doctors of physical medicine in the area and, if there are none available, find out where the nearest help can be obtained; and make a survey of all other possible services and equipment present in the area and where additional facilities may be obtained.

During the course of an epidemic, the chapter may finance all or any part of hospitalization costs which cannot be met by the family, provide funds to hospitals and other agencies to pay for special or general duty nurses and other professional workers and provide for their maintenance and living facilities if they come from outside the area, provide funds for the employment of additional nonprofessional help during the period of the epidemic, if such is needed, and many other services such as establishing an emergency center, serving as a clearing house for volunteers, furnishing additional equipment, etc.

When necessary the chapter pays all or part of hospitalization cost, medical and surgical fees, for all polio. patients regardless of the date of onset of the disease. It encourages, by financial assistance, postgraduate study by doctors, nurses and physical therapists in order that they may keep abreast of new developments in the treatment and care of the disease. It provides funds to all agencies to pay the salaries of personnel employed to tend infantile patients in accordance with the provisions of the organization. The chapter should keep the general public well informed about infantile paralysis through the use of the mass of material obtainable from the National Foundation.

The headquarters of the National Foundation coordinates both financial, equipment and personnel aid whenever the need arises and the request is made by the local chapter. It participates in preparedness programs when they are requested by the public health officials, hospital administrators, medical and professional groups and chapter personnel, and constantly initiates and develops plans for better medical care for polio. patients all over the country. It provides, through its coordinated organization, for the additional professional services when they are requested and also for any

equipment which is not obtainable in the area. It provides for the dissemination of information to the general public so as to prevent panic. It also provides financial assistance in the establishment of research work in the virus of polio., immunization procedures and effective treatment. Scientific research is rapidly growing under the aegis of the National Foundation. Through the year of 1949, a total of 634 research and educational grants to 88 institutions has been made, with the expenditure of $16,282,381.[108] The process of research has grown to such proportions that much of it may have a significant bearing on other unsolved diseases. Much of this work is tied up with determining the fundamental nature of the virus and of living organisms in general. Already by-products of research financed by the National Foundation have made very important contributions to the understanding and control of some of the diseases of the nervous system. Also, under this research, has come the application of the oximeter, a clinical device which measures oxygen in the circulating blood and thus has allowed increased safety in surgical operations, e.g., the Blaylock-Taussig operation for tetrology of Fallot. Also intensive research has been instituted in the field of immunization; however, this work is still in the experimental stages and there is much to be done before an active immunization program can be available to the general public. Research in the field of chemotherapy is being carried on. Intensive research for a drug which will act against many of the small viruses, including polio., is being sought. A systematic testing of chemicals is being carried out, under National Foundation grants, at certain laboratories, with the object of ascertaining if such a drug or compound exists.

The greatest single feature of the search for funds with which the National Foundation seeks to maintain its far-flung program is the March of Dimes. This is a yearly campaign which has been developed through the coordinated activities of national and local agencies and has achieved the status of a nationwide institution through the proper dissemination of material on the work of the National Foundation and the zeal of a corps of volunteer assistants.

General Epidemics in the United States. Following the first recorded epidemic of polio. which occurred in Worksop, England, in 1835, Colmer, in this country, was the first to describe polio. in a group of cases which he saw in West Feliciana, Louisiana, in

the fall of 1841. He described "teething paralysis," a sickness which he found confined to a small group of children under two years of age. However, the first real epidemic in the United States occurred in Otter Creek Valley, Vermont, in 1894, where 132 cases were reported. The investigator, Caverly,[109] at the time of this epidemic, distinguished between nonparalytic, abortive and paralytic forms, thus helping the understanding of the disease process and its epidemiology.

In this country, we find throughout this century, an average of about 4,500 cases reported annually, with epidemic peaks in 1916, 1921, 1927, 1931, 1935, 1937 and 1938, the greatest of these in 1916 with 27,363 reported cases, making a total of 176,369 through 1938. The first severe epidemic was reported by Wickman in 1905. Then in 1916, the U. S. had the severest epidemic in the history of the disease up to 1948 with reported cases throughout the country mounting to 27,363. Since then there has been a major epidemic in some locality in the country in practically every year.

The incidence of polio. has increased in the last thirty years as health statistics have shown. However, these statistics must not be taken too literally, for the most part, as many abortive and subclinical cases of polio. have not been reported heretofore because they were not recognized as such. Another reason why the statistics on polio. in the past could not be regarded as accurate is that physicans were not required to report communicable diseases and also, in the early stages of public health reporting, many physicians failed to comply with the requirements. Due to the perfected methods of detection of and knowledge of the disease, many of its forms are recognized today and reported as such which would have gone unrecognized in the past. Also, the reporting of polio. by physicians to the Department of Public Health and Communicable Diseases has been enforced.

Polio. is predominant in the younger age groups as evidenced by the Minnesota survey in 1946 of age groups involved in polio. However, during the past few decades, there has been an increase in the older age groups.

Social and Economic Factors in Polio. Polio. presents a problem, not only to the patient and his family and friends but to the community as a whole. As has been previously mentioned, it is

important to know just what facilities for the treatment and care of a polio. victim there are in any given community and how far afield one must go to obtain these necessities if the size of the community prohibits the maintenance of these permanently; it is important to coordinate present knowledge of the disease and put it to the best possible use and concurrently to place methods of treatment on a better basis. Thus we shall be able to give the benefit of such treatment to a greater proportion of its victims and shall benefit by reducing the economic problem of polio. to a more practical level. As we have learned through past experience, a polio. epidemic is not well-controlled by even the most rigorous methods as we know them today, in fact the ensuing economic disruption has had a very bad effect on the community at large without lessening the proportions of the epidemic, and the Yale Conference in January 1947 so advised. One of the best measures that could be devised to prevent too much waste and economic and social disruption would be to maintain a sort of general staff of people conversant with the problems of a polio. epidemic in all areas which seem to have recurrent epidemics. The methods of treatment for polio. are very expensive, both during the early stages and when the patient is convalescing. The after-care, such as supplying supportive apparatus in the cases which need it, also poses an economic problem.

When one sees the great fear and apprehension shown by families during the progress of an epidemic, it seems as though the now familiar picture of a child on crutches as the symbol of polio. is not the best possible means of bringing the disease to the attention of the public. The emphasis on the crippling effects of polio. tend to build up hysteria and emotional instability in even the most intelligent groups of parents during an epidemic, and to make them insecure and unable to give the patient the quiet and calm treatment that is so important. Some thought should be given to the fact that this well-known picture plus the natural emphasis on the more formidable aspects of the disease given to the public by the newspapers, does no possible good but may do a great deal of harm. It might be better to bring to the public mind, the number of cases who recover from this dread disease without any ill or lasting effects.

The great concern of parents of polio. victims due to their isola-

tion during the early period of the disease could be considerably lessened if the isolation hospitals would relax their regulations to some extent in order to permit parents to see the patient more frequently and assure themselves of their progress. During the long period of convalescence, both parent and child need skillful understanding in order to establish healthy attitudes toward one another and toward neighbors and friends who may be a focus of hostility because of their attitudes of fear and apprehension toward the victim of the disease.

The emotions of anxiety, tension and guilt are frequently displayed by parents towards the polio. patient and when the patient returns home, there is a difficult adjustment to be made on both sides. It takes a great deal of patience and understanding to create a healthy attitude between the two and this is one of the greatest adjustments that must be made. The parents and friends must exercise patience and understanding in order to receive the child in a normal situation, and the child, in his turn, must learn to adjust to a situation which has changed radically from his previous experience in the world, his period of adjustment in the hospital, and the new world of home.

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ANGIOCARDIOGRAPHY IN DIAGNOSIS OF CONGENITAL CARDIOPATHIES. (Archives des Maladies du Coeur, Paris, 44:1057, Dec. 1951). Angiocardiography became essential when effective surgical procedures for congenital heart disease were introduced, since definite diagnosis is necessary before surgery is undertaken. The surgeon requires from the cardiologist precise information in regard to the cardiac or vascular area in which he intends to operate and to anomalies that may make the procedure more difficult, such as abnormal venous return, right aortic arch, and abnormal position of the aorta or its branches. The authors do not believe that selective or regional angiocardiography should replace standard angiocardiography.—*Journal A.M.A.*

DEPARTMENT OF ABSTRACTS

STURGEON, P.: FATAL APLASTIC ANEMIA IN CHILDREN FOLLOWING CHLORAMPHENICOL (CHLOROMYCETIN) THERAPY. (Journal American Medical Association, 149:918, July 5, 1952).

Four instances of fatal aplastic anemia are reported in children who had on previous occasions received relatively small doses of chloramphenicol (chloromycetin) for minor illnesses. Three other cases of aplastic anemia (2 fatal, 1 with recovery) were observed over a greater time interval; in these there was no history of chloramphenicol therapy. It is pointed out that serious reactions in the former cases appear to be due to a human idiosyncrasy to chloramphenicol. It appears advisable, therefore, before prescribing chloramphenicol, to weigh carefully the relatively remote possibility of these serious hazards against the possible therapeutic advantages of this drug over other antibiotics not suspected of producing fatal toxic reactions. AUTHOR'S SUMMARY

MARESH, G. J.; DODGE, H. J. AND LICHTY, J. A.: INCIDENCE OF HEART DISEASE AMONG COLORADO SCHOOL CHILDREN. (Journal American Medical Association, 149:802, June 28, 1952).

Of 11,236 sixth grade school children examined, 36.4 per cent had physiological murmurs as the only unusual finding. The incidence rate for all definite organic heart disease in the sixth grade group was 9.4 per 1,000. The rate for rheumatic heart disease was 6.7 and for congenital heart disease 2.7 per 1,000. The condition in less than half of the sixth graders classified as having heart disease by this study had been so diagnosed previously. Of those with rheumatic heart disease, only about 50 per cent had a previous diagnosis of acute rheumatic fever or any of its major manifestations. The Spanish-American group had a consistently higher rate than the Anglo-Americans and children living in the open country or in towns of less than 2,500 population had consistently higher rates than children living in organized communities with 2,500 or more population. MICHAEL A. BRESCIA, M.D.

HODGES, C. V.: CHRONIC URETHRITIS IN GIRLS. (Journal American Medical Association, 149:753, June 21, 1952).

Twenty-five girls, ranging in age from 2½ to 9 years (average 5 years), were studied because of a urinary tract symptom whose duration averaged 2½ years. Chronic posterior urethritis has proven to be the commonest single basis for urinary tract infection in girls. The commonest symptoms were urinary frequency and a history of febrile episodes. Other symptoms included enuresis, urgency, and abdominal, loin, or back pain during acute episodes. Eighteen girls had shown pyuria on voided specimens but only four showed a significant degree of pus when the catheterized bladder specimen was examined. In the mild cases, endoscopy revealed hyperemia and edema of the bladder neck, increased prominence of the longitudinal folds and hyperplasia of the urethral epithelium. The severe cases revealed pale and granular mucosa, and the epithelial hyperplasia had advanced into villus and polyp formation. Improvement follows urethral dilatations and sulfonamides and antibiotic agents when indicated.

MICHAEL A. BRESCIA, M.D.

HOFFMAN, H. R.; SHERMAN, I. C.; KREVITSKY, F. AND WILLIAMS, F.: TEEN-AGE DRUG ADDICTS ARRAIGNED IN THE NARCOTIC COURT OF CHICAGO. (Journal American Medical Association 149:655, June 14, 1952).

Twenty-one teen-age addicts, ranging in age from 13 to 19 years, were evaluated. All but one of the boys were users of heroin. The age of onset of the use of the drugs was 13 to 19 years, with an average age of 16.6 years. Intelligence did not seem to be a factor in the addiction. All the youths lived in a thickly populated deteriorated area on the south side of Chicago. In all the cases, the mother, grandmother or sister emerged as the dominant figure for these boys. In more than 50 per cent of the cases, the father had been absent for most of the patient's life and no meaningful male substitute replaced him in the emotional life of the boy. The lowest income reported was $40.00 a week for a family of four and the highest was $95.00 a week for a family of three. Only four of these youths had a trade. All these youths had had menial odd jobs, such as shining shoes, porter and bus boy. Ten of them were unemployed at the time of their court appearances. There was a defeatist attitude in relation to employment. Most of the parents

indicated there was social drinking in the home, and liquor was frequently offered to the addict as a substitute for drugs. Clinics were opened at the Provident Hospital and the University of Illinois College of Medicine for the treatment and rehabilitation of adolescents and young adults with a history of using drugs. Only those who are not physically dependent on drugs and do not require hospitalization are treated in the clinics.

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OLDFELT, V.: EXPERIMENTAL GLUTAMIC ACID TREATMENT IN MENTALLY RETARDED CHILDREN. (Journal Pediatrics, 40:316, March 1952).

Granulated glutamic acid was administered to a series of 16 children between the ages of 7 and 15 years, with I.Q.'s ranging from 42 to 77, for the purpose of studying its effect on the I.Q. The dosage was 18 Gm. per day in three doses and the duration of treatment just over four months. A control group comprising 15 children of corresponding ages and intelligence was treated concurrently with a granulated substitute. The treatment had no demonstrable effect. AUTHOR'S SUMMARY.

STIMSON, P. M.: HOME CARE OF PATIENTS WITH ACUTE POLIOMYELITIS. (Journal American Medical Association, 149:719, June 21, 1952).

Reasons are given for modification of the present widespread tendency to send at once to hospitals every patient whose illness is at all suggestive of acute poliomyelitis. Most patients with suspected poliomyelitis, nonparalytic forms, and many of the mild forms of the disease might better be cared for at home, particularly if the local health authorities can provide not only diagnostic consultation to aid the family physician to differentiate poliomyelitis from other conditions but also can provide the family physician with visiting nursing and physical therapy to care for the patients in the home. Out-patient clinics should be available for the follow-up care. Cases in which home treatment is suitable are described, and their management is discussed. Indications for hospitalization and some conditions and factors that make care at home undesirable are stated. AUTHOR'S SUMMARY.

BOOK REVIEW

THE DOCTORS JACOBI. By Rhoda Truax. Cloth. Pp. 270. Price $3.50. Boston: Little, Brown and Company, 1952.

This book is a brief biography of two forceful and determined characters, Mary Putnam Jacobi and Abraham Jacobi. However, this reviewer felt that a disproportionate share of the book was devoted to Mary Putnam. In so doing Abraham Jacobi was comparatively neglected. Mary Putnam deserves a biography for herself and so does her husband. In trying to blend both of them in one volume, one of the characters suffers by so doing. We gain an interesting glimpse into the extreme difficulties of a woman gaining an education, especially in medicine in the mid-nineteenth century. Only a woman of the determination and intelligence of Mary Putnam could outweigh all difficulties. There was one medical school in the United States for women—if medical school it could be called. The majority of the schools, even for men, at that time were most inadequate, to say the least. Mary Putnam was the first woman to gain admittance to the medical school in Paris, in which she was the only woman. Her contribution to medicine was mainly in the educational and public health fields. Abraham Jacobi, who is better known to the medical profession in general, stayed on the medical horizon for many years. He saw many changes in medical practice. The most notable changes probably were the discovery of bacteria as a cause of disease and then the introduction of diphtheria antitoxin. Diphtheria hangs over the book with a heavy pall. This was a dreaded disease and even Jacobi's favorite son died from diphtheria. He was especially interested in the treatment of infants and children. He was most instrumental in changing the concept of treating infants and children and not approaching them as heretofore as "small adults." Abraham Jacobi apparently loved children, which makes it difficult for me to reconcile this with his atheism. He seemed to be an unhappy man.

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OUR MARINES' LIFELINE to the sea was in danger. A Communist force of 4,000 men had seized the key hill overlooking Hagaru-ri in the desperate Chosin Reservoir fighting. The hill had to be taken. But there were no combat forces available.

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